

Complete Summary

GUIDELINE TITLE

Procedure guideline for myocardial perfusion imaging.

BIBLIOGRAPHIC SOURCE(S)

Strauss HW, Miller DD, Wittry MD, Cerqueira MD, Garcia EV, Iskandrian AS, Schelbert HR, Wackers FJ, Balon HR, Lang O, Machac J. Procedure guideline for myocardial perfusion imaging, 3.0. Reston (VA): Society of Nuclear Medicine; 2002 Jun 15. 9 p. [7 references]

GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: Society of Nuclear Medicine. Procedure guideline for myocardial perfusion imaging. Reston (VA): Society of Nuclear Medicine; 1999 Feb. 26 p. (Society of Nuclear Medicine procedure guidelines; no. 2.0).

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SCOPE

DISEASE/CONDITION(S)

- Coronary artery disease
- Congestive heart failure
- Ischemic or idiopathic cardiomyopathy
- Myocardial perfusion abnormalities

GUIDELINE CATEGORY

Diagnosis
Evaluation
Risk Assessment

CLINICAL SPECIALTY

Cardiology
Nuclear Medicine
Radiology

INTENDED USERS

Allied Health Personnel
Physicians

GUIDELINE OBJECTIVE(S)

To assist nuclear medicine practitioners in recommending, performing, interpreting, and reporting the results of myocardial perfusion imaging studies

TARGET POPULATION

Adults with known or suspected coronary artery disease or congestive heart failure

INTERVENTIONS AND PRACTICES CONSIDERED

1. Myocardial perfusion imaging (MPI), including rest-injected MPI and stress MPI
2. Modalities for stress myocardial perfusion imaging, including the following:
 - Exercise
 - Submaximal
 - Symptom limited
 - Maximal
 - Pharmacologic Stress
 - Vasodilators
 - Adenosine
 - Dipyridamole
 - Inotropic
 - Arbutamine
 - Dobutamine
 - Dobutamine+atropine

MAJOR OUTCOMES CONSIDERED

Safety and utility of myocardial perfusion imaging (MPI)

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Hand-searches of Published Literature (Primary Sources)
Hand-searches of Published Literature (Secondary Sources)
Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Literature searches were performed. In addition, references known to experts and references from the nuclear medicine community were considered.

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Not stated

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not applicable

METHODS USED TO ANALYZE THE EVIDENCE

Review

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

Drafts of the guideline were submitted to members of the Guideline Development subcommittee (methodologists) and the Task Force (subject experts). These reviewers indicated on a line-by-line basis any suggestions or recommendations for the revision of the guideline. The percentage of agreement for all reviewers was calculated for each revision and compiled by the Society of Nuclear Medicine (SNM) central office. It is expected that the percentage of agreement will increase with each revision.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

When the Task Force and Guideline Development Subcommittee completed their edits, draft procedure guidelines were distributed to the Society of Nuclear Medicine (SNM) Sample Review Group for comment. (The SNM Sample Review Group is a cross-section of approximately 100 nuclear medicine practitioners representing every field of specialization).

The guideline was approved by the SNM Commission on Health Care Policy, the Board of Directors, and the House of Delegates.

The updated guideline was approved June 15, 2002.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Background Information and Definitions

Myocardial perfusion imaging (MPI) utilizes an intravenously administered radiopharmaceutical to depict the distribution of nutritional blood flow in the myocardium. Perfusion imaging identifies areas of reduced myocardial blood flow associated with ischemia or scar. The relative regional distribution of perfusion can be assessed at rest, cardiovascular stress, or both. Imaging can also be performed during acute events (e.g. chest pain of unknown etiology, such as in the coronary care unit or emergency department). Perfusion images can be recorded with planar or tomographic single-photon or tomographic positron imaging techniques, utilizing radiopharmaceuticals that are extracted and retained for a variable period of time by the myocardium. The data can be analyzed by visual inspection and/or by quantitative techniques. Some radiopharmaceuticals employed for MPI and approved by the Food and Drug Administration (FDA) include: thallium (Tl)-201 and the technetium (Tc)-99m-labeled radiopharmaceuticals such as sestamibi, tetrofosmin, and teboroxime, for single-photon imaging and rubidium (Rb)-82 for positron emitting tracer (PET) imaging.

Patients with significant coronary artery narrowing as a result of coronary artery disease (CAD) and/or abnormal coronary flow reserve will have a zone of diminished radiopharmaceutical concentration in the area of decreased perfusion. If either the area or severity of decreased tracer concentration is worse when the tracer is administered during stress than rest, the zone of decreased tracer concentration most likely represents ischemia. If the area of diminished tracer concentration remains unchanged, even after injection at rest, the defect most likely represents scar, although in a significant number of cases, it may represent viable, underperfused myocardium.* In addition to regional perfusion, recording

the data with both single-positron emission computed tomography (SPECT) and electrocardiogram (ECG) gating permits calculation of global and regional ventricular function and assessment of the relationship of perfusion to regional function.

*Such fixed abnormalities may also represent high-grade obstruction in zones of viable, hibernating myocardium. When Tl-201 is used as the radiopharmaceutical, redistribution of tracer on delayed images may be useful to distinguish these lesions from scar. When Tc-99m-labeled radiopharmaceuticals are used, administering nitroglycerin before injection at rest may help make this distinction by improving perfusion (and tracer uptake) in the severely ischemic but viable region. Patients who fail to demonstrate myocardial viability with conventional SPECT imaging techniques may benefit from F-18 FDG PET imaging, especially those patients with marked left ventricular dysfunction.

Common Indications (see Table 1 in the original guideline document)

- Assess the presence, location, extent, and severity of myocardial perfusion abnormalities
- Determine the significance of anatomic lesions detected by angiography
- Detect viable ischemic myocardium

Common Clinical Settings for Myocardial Perfusion Imaging

A. Known or suspected CAD

1. Diagnosis of physiologically significant CAD (presence and severity)
2. Determine prognosis (risk stratification based on extent and severity of myocardial perfusion abnormalities and left ventricular function)
3. Differentiate between coronary and noncoronary causes in patients with acute chest pain syndromes seen in the emergency room

B. Follow-up of patients with known CAD

1. Evaluate the immediate and long term effects of:
 - a. Revascularization procedures (such as coronary artery bypass grafting, angioplasty, stent placement, use of angiogenic growth factors, etc.)
 - b. Medical or drug therapy, whether designed to prevent ischemia (e.g., drugs that alter myocardial metabolic oxygen supply/demand relationship) or modify lipids and other features of atherosclerotic plaque (e.g., statin drugs)

C. Known or suspected congestive heart failure

1. Differentiate ischemic from idiopathic cardiomyopathy
2. Help assess whether patient has sufficient viable myocardium overlying the infarction to consider revascularization

Procedure

The detailed procedure recommendations in the guideline address the following areas: patient preparation; information pertinent to performing the procedure (i.e., important data that the physician should have about the patient at the time the exam is performed and interpreted); precautions/contraindications; information regarding the radiopharmaceutical (i.e., ranges of administered activity, organ receiving the largest radiation dose, effective dose), image

acquisition; interventions; processing; interpretation/reporting; quality control, and sources of error.

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of evidence supporting the recommendations is not specifically stated.

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

The intent of the procedure guideline is to describe myocardial perfusion imaging, in order to maximize the diagnostic information obtained in the study while minimizing the resources that are expended.

POTENTIAL HARMS

There is cardiovascular risk associated with stress myocardial perfusion.

CONTRAINDICATIONS

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Exercise Stress

Contraindications to exercise testing are unstable angina with recent (<48 hr) angina or congestive heart failure, documented acute myocardial infarction (MI) within 2 to 4 days of testing, uncontrolled systemic (systolic >220 mmHg, diastolic >120 mmHg) or pulmonary hypertension, untreated life-threatening arrhythmias, uncompensated congestive heart failure, advanced atrioventricular block (without a pacemaker), acute myocarditis, acute pericarditis, severe mitral or aortic stenosis, severe obstructive cardiomyopathy, and acute systemic illness. Relative contraindications to exercise stress include conditions that may interfere with exercise, such as neurologic, orthopedic, arthritic, or severe pulmonary disease or peripheral vascular disease, severe deconditioning, or inability to comprehend the exercise protocol.

Pharmacologic Stress

Patients with a history of severe bronchospasm, pulmonary disease (i.e., asthma or pulmonary hypertension), prior intubation for severe pulmonary disease, systemic hypotension (systolic <90 mmHg), severe mitral valve disease, and prior hypersensitivity to dipyridamole or adenosine should not undergo vasodilator

stress with dipyridamole or adenosine. Patients requiring methylxanthine-containing medications to control their bronchospasm should not be tested with vasodilator agents. Ino/chronotropic agents may be employed in these patients. Patients with mild bronchospasm may undergo vasodilator stress testing, particularly after pretreatment with an albuterol inhaler.

Patients with advanced (second or third degree) atrioventricular block or sick sinus syndrome should not be tested with adenosine because of its negative dromotropic (SA + AV node) effect. Additional contraindications to vasodilator agents include severe aortic stenosis, severe obstructive hypertrophic cardiomyopathy, and severe orthostatic hypotension. The use of dipyridamole or adenosine is not recommended in pregnant or lactating females.

Ino/chronotropic agents are contraindicated in patients with ventricular tachyarrhythmias. These agents should be used with caution in patients with unstable angina, obstructive or hypertrophic myopathy, or soon after acute infarction.

QUALIFYING STATEMENTS

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- The Society of Nuclear Medicine has written and approved guidelines to promote the cost-effective use of high quality nuclear medicine procedures. These generic recommendations cannot be applied to all patients in all practice settings. The guidelines should not be deemed inclusive of all proper procedures or exclusive of other procedures reasonably directed to obtaining the same results. The spectrum of patients seen in a specialized practice setting may be quite different than the spectrum of patients seen in a more general practice setting. The appropriateness of a procedure will depend in part on the prevalence of disease in the patient population. In addition, the resources available to care for patients may vary greatly from one medical facility to another. For these reasons, guidelines cannot be rigidly applied.
- Advances in medicine occur at a rapid rate. The date of a guideline should always be considered in determining its current applicability.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Living with Illness

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

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ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

1999 Feb (revised 2002 Jun 15)

GUIDELINE DEVELOPER(S)

Society of Nuclear Medicine, Inc - Medical Specialty Society

SOURCE(S) OF FUNDING

Society of Nuclear Medicine (SNM)

GUIDELINE COMMITTEE

Task Force

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FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

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GUIDELINE AVAILABILITY

Electronic copies: Available from the [Society of Nuclear Medicine \(SNM\) Web site](#).

Print copies: Available from SNM, Division of Health Care Policy, 1850 Samuel Morse Dr, Reston, VA 20190-5316; Phone: 1-800-513-6853 or 1-703-326-1186; Fax: 703-708-9015; E-Mail: ServiceCenter@snm.org.

AVAILABILITY OF COMPANION DOCUMENTS

The following are available:

- Society of Nuclear Medicine. Procedure guideline for guideline development. Reston (VA): Society of Nuclear Medicine; 2001 Jun (version 3.0). Electronic copies: Available from the [Society of Nuclear Medicine Web site](#).
- Society of Nuclear Medicine. Performance and responsibility guidelines for NMT. Reston (VA): Society of Nuclear Medicine; 2003. Electronic copies: Available from the [Society of Nuclear Medicine Web site](#).

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PATIENT RESOURCES

None available

NGC STATUS

This summary was completed by ECRI on July 20, 1999. It was verified by the guideline developer as of August 5, 1999. This summary was updated by ECRI on April 14, 2005.

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Date Modified: 9/25/2006

